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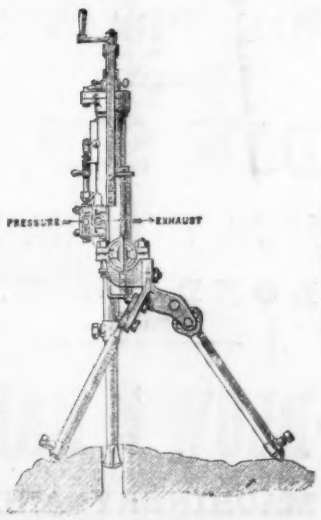

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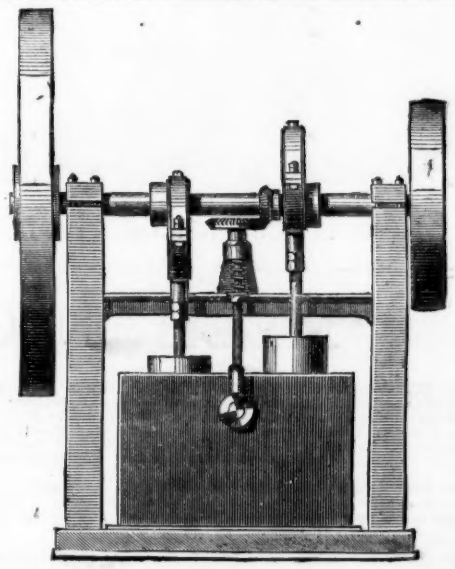

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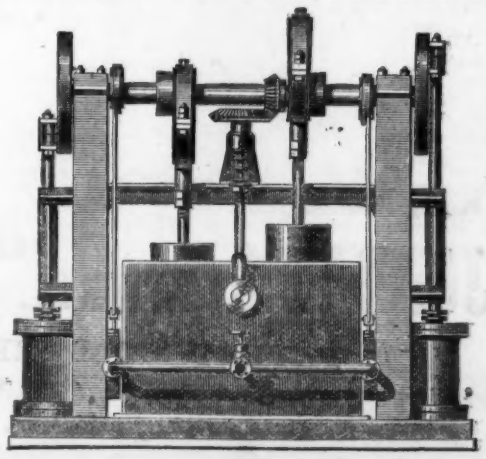

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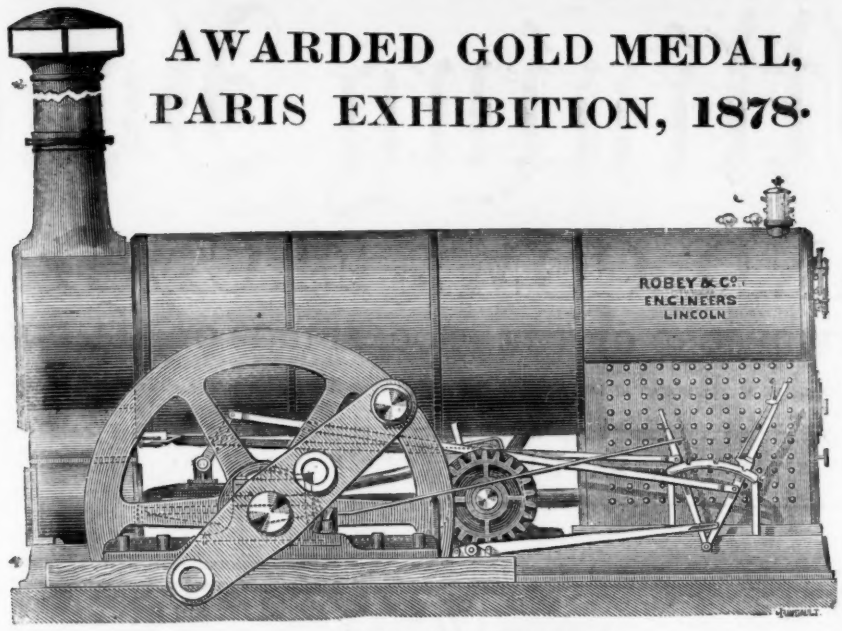

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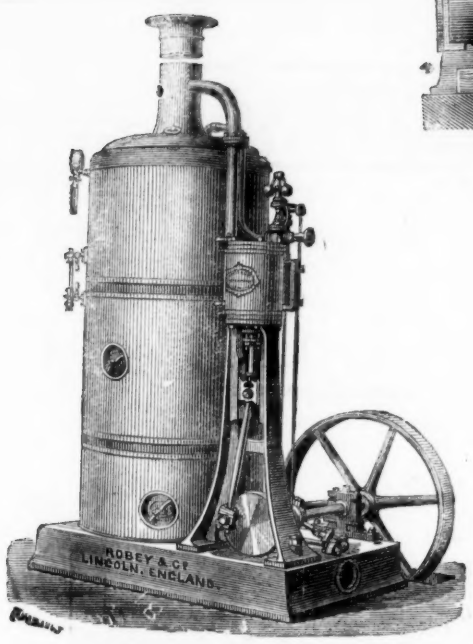

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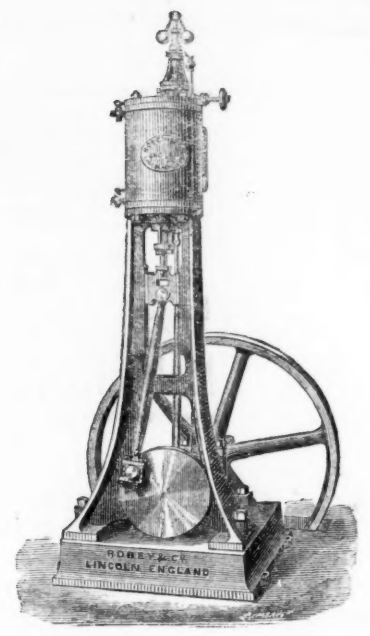

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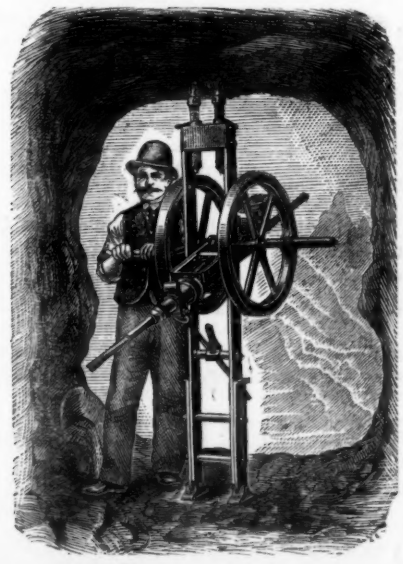

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Original Correspondence.

DEPRESSION OF TRADE, PROBABLE REVIVAL, NEW PROCESS AFFECTING STEEL MANUFACTURE, AND THE IRON MINING DISTRICTS OF THE UNITED KINGDOM.

In the article published under this head in the Supplement to the *Mining Journal* of the 7th inst. some errors have crept in, which are now corrected. The last word in the first paragraph reads "employers"; it should read *emp'oyees*. In the third line of the third paragraph, for "safer years," it should read *sager years*. In the third column, 12th line from the top of second paragraph, it reads "as the price of 2 tons of Forest coal"; it should read, *as the price of 2 tons of Forest ore*. In the 19th line in the same paragraph we have, "scoria would make the coal"; it should read, *scoria would make the cost*. On page 583, third column, and in the 10th, 9th, and 8th line from bottom, we find, "the present year's purchase for four years deferrence, according to an acknowledged authority, would be 23,678*l*."; it should read, *the present year's purchase for four years deferrence, according to an acknowledged authority would be* 2·3678.

THE COAL TRADE, AND COLLIERS' WAGES.

SIR,—In the year 1619 (now 230 years ago) Mr. Grey, in his Choro graphia of the Coal Trade, says:—"There come sometimes into this river (the Tyne) for coale 300 sayle of ships. Many thousand people are employed in this trade; many live by working them in the pits; many live by conveying them to the Tyne; many are employed in conveying them in the keels from the stathes aboard the ships. One coalowner employeth 500 or 1000 in his works, yet, for all his labour, care, and cost, can scarce live of his trade; nay, many of them hath consumed and spent great estates, and died beggars. I can remember one of them that hath raised his estate; many I remember that hath wasted great estates. Some South gentlemen have upon great hope of benefit come into this country to hazard their money in coal pits. One gentleman of great ingenuity and rare parts adventured into our mines with his 30,000*l*., who brought with him many rare en gines not known in these parts. As the art to bore with iron rods to try the deepness and the thickness of the coale, rare engines to draw water out of pits, wagons with one horse to draw down coales from the pits to the stathes, &c. Within a few years he consumed all his money, and rode home upon his light horse."

The coal trade of to-day is another instance of history repeating itself. Day by day we hear of collieries suspending operations because they are no longer remunerative, and it is said that within the last four years more than 800 coal pits have been closed because at the present prices of fuel they cannot be worked. It is quite true that during the high prices of coal obtaining a few years ago large sums of money were invested in collieries, but Prof. Fawcett, in his recently published lectures on free trade and protection, says—"When profits are exceptionally low there is just the same inducement to contract a business as there is to extend it when profits are exceptionally high;" and he says further, "In the present state of the coal trade few new mines will be opened to take the place of those which are gradually being exhausted; the supply will thus become restricted, there will be a tendency for prices to rise, and a sudden increase in the demand may again produce a rise in prices as marked as that which occurred five years since; and thus exceptional prosperity and exceptional depression succeed each other in regular cycles." It is generally believed that the great rise in prices was brought about by the action of the colliers themselves through their Trade Unions, but from evidence given before a Select Committee of the House of Commons appointed in 1873 it was conclusively established that the rise in the price of coal was greater, and the advance in the wages of the workmen less, than most people had imagined. At page 191 in this evidence it is stated that in the West Yorkshire district between October, 1871, and March, 1873, when the highest prices were reached, there was an advance of 15s. 5d. a ton in the price of coal at the pit's mouth, while wages in this period were only advanced 1s. 1½d. per ton. During these years the price of coal was raised upon eight different occasions, but only upon five occasions was there any rise in wages, and in every single instance the rise in wages was subsequent to the rise in price of coal.

The output of coal for last year would be about 130,000,000 tons, and to this extent annually our fuel stores are being gradually but surely exhausted. At the present time this is being done without adequate return to the capitalists who have invested their money in these undertakings, and in most cases at a loss of both interest and principal. The time will come when these vast fuel stores must be exhausted. Prof. Marshall, in a work just published—Coal: its History and Uses—(Macmillan and Co.), says that "the Britain with which we are familiar as the factory, the mart, the exchange of the world, with its crowded population, its vast wealth, and splendid material achievements, the very paradise of self-satisfied statistics, cannot possibly continue to exist when the coal, which is the mainspring of its energies, has disappeared, and that there can hardly be a doubt that the period of transition from our present position to that which our resources other than coal could support will be one of social and political trial such as modern statemanship never yet has had to face. We have accumulated and are accumulating immense debts, great populations, and wide-spread traditions of social comfort and political power among those populations, all which will make the turn of this mighty tide a grave and ominous time. A very sufficient proof of our absolute dependence on coal was afforded us by the coal famine, as it was called, of 1872-3. The confusion and distress then occasioned to us all by a deficit amounting in the whole to not more probably than 1 per cent. of the world's supplies of coal, or 2 per cent. of our own, and the subsequent prolonged depression and even collapse, for which the high prices resulting from that deficit are largely responsible, are only a premonition of what would ensue were such a deficit to become chronic, and a real coal famine come upon us.

That such a famine may come is possible, and, indeed, not at all improbable, as I will endeavour to show. Colliery working is at the best one of considerable risk to the proprietor. A coalowner is bound to invest a very large capital before he can commence winning the full and send it to market. Mr. Joseph Cowen, speaking in his place in the House of Commons, says he could not insure himself against accidents. A man might buy a ship, insure it, send it to sea, and sink it, and perhaps be a gainer in consequence; but they could not insure a mine, and everybody who lived in mining districts knew numerous instances where men had been ruined through accidents in their collieries. They might make up their minds, therefore, that under any circumstances, even the most favourable, they would always have accidents in these undertakings. As to the colliers themselves, there were hundreds and thousands of men who met with accidents in the mines who, though not killed outright, were maimed for life, and whose calamities were never heard of. The Home Secretary received a list of the persons who were absolutely killed, but he received no return as to the number of men who had their backs injured, their ribs squeezed in, or their legs broken; men who were carried home alive who might live for a few weeks, a few months, a few years, but who were useless to themselves and a burden to their relatives. During the last 20 years it is calculated that more than 1,000,000 colliers have been killed or injured in the pursuit of their employment in this country.

As a rule, only the sons of colliers become colliers, and it rarely happens that a lad whose father is employed in any other occupation descends a coalpit. The collier's lad is not now permitted to go to work in the pit at the tender age of eight or ten years as formerly, but is sent to school for a few years, and receives instruction which may fit him not only to be a better collier than his father, but it may also be to qualify him to be otherwise employed than as a collier. The wages now being paid to the colliers in some districts are such that where the fathers can find other employment they are doing so, and in many instances which I could name they are emigrating or leaving the collieries with their lads for any other occupation in preference to the darkness and danger of the coal pits at the low rate of wages now obtaining. These lads will become accustomed to what we all enjoy so much—the pure air, the bright blue sky, and the green fields, and within a very short period I venture to predict we shall find colliers scarce. It has often been suggested that the male criminals of our country should be made to work in our collieries, and surely if this might be considered fit punishment for crime, the men and boys who voluntarily undertake the labour at the risk of their lives should be amply repaid for their work. I cannot but agree with Mr. Ellison that the colliers' wages are cut low enough, and to attempt to still further reduce them would be fatal to the best interests of the country. L.

Manchester, June 20.

MINING LEGISLATION.

SIR,—In last Saturday's Journal a writer seems dissatisfied with the mode in which the manager's clause of the Mines Act is interpreted. If I understand him aright, his interpretation is that a manager shall manage no more than one colliery, and that he shall see every part of that colliery daily. The 26th section says, "Every mine shall be under the control and daily supervision of a manager." The 72nd section defines a mine to be "All the shafts, levels, planes, works, machinery, and sidings, both below ground and above ground, in or adjacent to the mine, and belonging to the mine." If a mine has 30 men employed underground it requires a certificated manager. There are also mines with 1500 or 2000 men which, of course, by the Act may be managed by one manager. I want to show you that if it is meant by control and supervision that the manager is to see every part of the colliery daily it would be utterly impossible for him to do so. In a colliery employing even 100 men the underground passages may exceed two miles, and the works above ground may cover a considerable area. Suppose the seam is 2 ft. high, and worked by the long-wall method, is it to be expected that the manager will crawl on his knees along these faces, and then go out and in each road examining the state of the roof, the workings, the machinery, ropes and chains, do the same thing on the surface, and attend to his commercial work for the day? Such a thing I can assure you is utterly impossible. The manager may go underground to ascertain the general state of matters, but he must depend upon his staff, whose instructions are laid down in the general and special rules provided for by the statute. Further, it will easily be seen that the examination by the manager must be a general one. The state of the colliery as regards safety may vary many times during the working day, and this must be left to the under officials. It therefore, rests with the manager to lay down the general rules for the working of the colliery, and to see by the best modes at his disposal that these are carried out.

The question is—Who is the manager of a colliery? I hold it to be the man who controls the expenditure. The man who examines the pay bills, who complains of the costs, that man is the manager. Such a man may not be able to go down the pit every day and examine the state of the workings, but inasmuch as he interferes with the expenditure he directly controls, and the mine is under his control. Now, if in a mine with 100 men a manager cannot make a personal inspection of all the workings daily, how much less will he be able to do so where 1500 men are employed and there are 15 shafts? His personal supervision will be only one fifteenth. But supposing you were content with the supervision of the 100 men, would 15 managers be better than one? Would each manager not have his own system of working, his own system of ventilation, and unless there were 15 upcast shafts and 15 downcasts, 15 fans, 15 winding-engines, would they be likely to agree without a head over them? I think I need not carry the reasoning further to show that if they were under one head with assistants it would be much better in every way.

Now the manager of a mine is a superior manager or inferior manager according to the pay he gets. He may have 100*l*. a year, or he may have 2000*l*., but if he has 2000*l*. it will only be because he can take a larger view of matters than the man who has 100*l*. If you adopted the fifteen managers you would have fifteen inferior men. If you adopted the one with 2000*l*. you would have one superior man over the whole. Take the North of England system, where there is better discipline than in any other district, the late Nicholas Wood and Mr. Thomas Forster were managers for many collieries, and directed the general working of the collieries living miles away, but having qualified assistants at the various collieries holding themselves responsible for them. But the Act of 1872 came in with its daily personal supervision, which some held to mean examining every place in the pit daily, and it changed this state of matters. People who hold positions like those, and occupied by these gentlemen became agents, and hence arose the confusion which now exists as to who shall be the responsible party if anything goes amiss. The agent with the three months before his eyes shies off, and puts in a man of straw with 100*l*. a year to bear the responsibility. The proper remedy for this would be to make the agent the manager. He was so before the Act, let him be it now, and make him responsible for the whole working which he in any way directs, or of which he controls the expenditure.

Reverting again to the mine with 100 men, if one superior man had the direction of 15 such mines, and was responsible for them, then the mines would be laid out according to one system, and that the best in the opinion of a good engineer. The tendency of the certificated manager, as it is worked out, is to place a lot of inferior men in positions they were never intended to occupy, where the owner interferes as he chooses, and the manager is there to stand the risk. I believe it is certainly not improving the management of mines.

The proper method, I think, would be to place the mines under the control of superior men, who can only be had by giving them good salaries, and letting them have any reasonable number of mines under their control. The great point is making them responsible for all damages which might occur through mismanagement.

AN ENGINEER.

OCHRE.

SIR,—Can you or any of your readers inform me the selling price of Cornwall ochre, first-class quality, equal to the French, and whether there is at the present time a large demand for it, and in what districts it is the most largely consumed? ENQUIRER.

SHEFFIELD PIG-IRON.

SIR,—No doubt many of your readers will have seen the paragraphs in the papers noting the progress made in the process for making Bessemer steel from ordinary ironstone. It appears from a statement in the Times that "the new processes will very greatly benefit the Middlesborough district, but the advantages from them to the Sheffield district will be even greater." Mention is made that the clear gain to the Middlesborough district will be 4s. per ton on the ingot, and to the Sheffield district 8s. per ton. It may be interesting to know that a statement bearing on this question appeared in a Sheffield paper about the middle of last April, by which it appears that the oolite pig made in the local furnaces and the ores obtained from Frodingham and Northamptonshire is sold, delivered in Sheffield, at 41s. 6d. per ton, whilst the value of hematite for the Bessemer purpose is 55s. per ton. It must be remembered that the Frodingham and other local ores are far superior to those of Cleveland, inasmuch as the Sheffield pig contains only about one-third of the phosphorus found in Cleveland iron.

There is no doubt whatever that when the dephosphorising method becomes established the Sheffield pig-iron referred to will take the place of the present expensive hematite in the Bessemer converters. When this change comes about it means that the increased demand for the local pig will amount to about 7000 tons a week. We hear that capitalists are negociating with the Duke of Rutland for the lease of his ironstone near Waltham, to which it is proposed the Great Northern Railway shall make a branch from Salford with a view of obtaining cheap transit. We think, however, that capital should be now invested by shrewd far-seeing men into such Sheffield companies as possess their own furnaces and mines, and it is well known that there are such now paying on their present price 5½ or 6 per cent. We believe that Parkgate, Brown, Bailey, and Dixon and others are very much below their value, and give this hint of which several are now taking advantage to the partial relief of the distressed, and in many cases bankrupt, shareholders forced to sell—shipwrecked, as it were, in sight of land. AN OBSERVER.

Leeds, June 24.

UTILISATION OF SULPHIDES AS FUEL.

SIR,—I read in your valuable Journal of last week a letter from a friend of mine, Mr. Blanchard, mining engineer, near whom I resided in Italy many years. This letter refers to the process of Mr. John Hollway about a new application of rapid oxidation by which sulphides are utilised as fuel. Mr. Blanchard thinks that the process is applicable in the Italian mines, where are many deposits of pyrites of iron, and large veins of copper and argentiferous lead, ordinarily very poor in metal, where also the fuel, vegetable or mineral, is dear or totally wanting.

Mr. Blanchard is right on what concerns the Italian mines, but let me tell you that the true place where the Hollway process is particularly applicable is North America. There are there many mines of pyrites of iron, copper, lead, and zinc, all containing gold and silver, where fuel is wanting, and where the Hollway process is immediately applicable. I myself worked some of these mines in California in the year 1859, and thence visited the Colorado mines in 1867, and revisited all the Californian mines in 1868 with those of Nevada. Since then the famous Utah and Black Hills mines have been discovered, and recently those of Leadville in the Rocky Mountains. There is, I repeat, the true place where the Hollway process must be worked, and I do not doubt that in a few years a large quantity of those mines will employ so economical a method of fusing ores without fuel. It is certain that in the United States Mr. Hollway will not only find the mines but also the men and the capital necessary to the application of his valuable process.

L. SIMONIN,
Mining Engineer and Honorary Professor of Geology at the School of Architecture, Paris.

London, June 24.

TREATMENT OF COPPER SULPHIDES.

SIR,—Although I do not dispute that the treatment of copper pyrites by burning them with a portion of their own sulphur may be to a certain extent admissible, I cannot as a metallurgist bring myself to believe that the employment of the contained sulphur as a substitute for other fuel in the making of a regulus can possibly be other than wasteful and uncertain, and I do not hesitate to say that upon the commercial scale, and taking the copper pyrites as they come from even a single mine (and it would of course never pay to increase the size of our spoil banks by adopting a process which is applicable only to perhaps one-fourth of the ores raised), the project must prove unremunerative, and thus disappointing to those who may risk their money in attempting to develope it. The idea of burning sulphur worth 5*l*. 10*s*. per ton as a substitute for coal, which can usually be obtained at 1*l*. per ton, is alone enough to create doubt as to the commercial value of the process, more especially as it is well known that the whole of the constituents of copper pyrites can be turned to commercial account, and that, too, with a very small outlay for the necessary working plant.

In connection with the metallurgy of low produce ores few names are more favourably known than that of Mr. Thomas H. Cobley, of Dunstable, and he has recently patented a process which, far from burning up the valuable sulphur contained in the pyrites, will secure, by the judicious application of electricity, the whole of the constituents in a merchantable condition. He proposes to get those constituents into solution in the first instance, and then to throw down by electricity those which are marketable, and in such a way that each is obtained separately. As much of the process is worked by the by-products, the cost is insignificant. When the ore contains chiefly sulphides as in the case of cupreous pyrites, it is to be carefully roasted or calcined so as to eliminate the extraneous sulphur and convert the sulphide into a soluble sulphate. This conversion may be effected by any known means, but it is preferred to effect it by exposing the crushed pyrites in a closed furnace provided with a chamber for collecting the sulphur fumes to a temperature at which the one atom of sulphur is driven off, leaving the mass in the form of protosulphide. The protosulphide thus obtained is drawn upon the hearth of an oxidiser and roasted down till sulphate is formed. In order to complete sulphatisation at the close of the roasting a little powdered pyrites or sulphur may be thrown in. The mass is then removed to lixiviating tanks where it is lixiviated by steam or steam and water or liquor from the depositing tanks herein after mentioned. Before lixiviation the roasted mass may be tempered with a little dilute sulphuric acid or persulphate in order to take up oxide formed during the roasting. The solutions may be strengthened by passing them repeatedly through fresh masses of the roasted ore.

Iron and other impurities are removed from the solutions when cold by the addition of powdered limestone or chalk, magnesite, or dolomite, or by passing the solutions through beds of these materials. Or the solutions containing salts of copper, iron, alumina, and other substances are concentrated to a crystalising strength, then allowed to cool and crystalise, whereupon the crystalised salts can be removed and the mother liquors can be used for attacking fresh quantities of ore. Or the solutions may be evaporated to a pasty condition by passing over or through them the hot sulphureous fumes proceeding from the roasting, the fumes being thus cooled ready for their subsequent treatment or application. The crystals or pasty masses obtained as above described contain matters which obstruct electrolytic action. To remove these he calcines at a temperature below red heat, so as not to decompose the sulphate of copper, but to reduce the iron compounds to subsulphate, oxide, and other insoluble conditions.

The mass thus calcined being again dissolved furnishes a solution of sulphate of copper suitable for electrical deposition. In effecting the electrical deposition of copper from the solutions thus obtained, in order to save time and labour, he feeds the solution with oxide or carbonate of copper, so as to keep up the strength of the depositing liquor. To prevent polarisation during deposition he introduces into the depositing vats fumes of sulphurous acid from the roasting ore, so as to absorb oxygen, and for this purpose other gases, such as carbonic oxide or products of combustion of fuel may be employed. For the precipitation of metallic copper he employs currents of electricity, which may be obtained from any known source, but conveniently from the working of a dynamo-electric machine. He converts the sulphurous fumes into sulphuric acid and sulphur by condensing them in acidulated water or a solution of an alkaline sulphate, such as sulphate of soda or sulphate of alumina, through which a current of electricity is conducted until the acid is present in considerable quantity. The mixture being then left to settle till the sulphur subsides the acid liquor is decanted, and may be concentrated in the usual way, or it may be at once applied in dissolving ore.

The process described, with suitable modifications, is applicable to ores containing carbonates of copper. In order to facilitate the mechanical separation of the gangue and to concentrate the copper he finds it advantageous to drive off the carbonic acid by a gentle roasting. The roasted ore is then placed in a receptacle in which loose stone blocks are carried round by revolving arms as in apparatus for grinding flint or for treating silver ores. While the mass is being triturated water is allowed to flow over it, so as to facilitate the operation and to float over the fine particles, which are collected in settling vats. The enriched slimes thus obtained may be further dressed and smelted in the usual way, or they may be dissolved in sulphuric acid or liquors from the depositing vats to form sulphate of copper, from which metallic copper is electrically deposited, as above described. By feeding the depositing vats with the oxide the strength of the depositing solution may be maintained. The carbonate or concentrated oxide may likewise be converted into sulphate by roasting them with the crude sulphur resulting from the electrical treatment of the sulphurous fumes or the condensed fumes of the roasting or with an admixture of powdered pyrites. The roasted product is then lixiviated and treated as already described for sulphates otherwise obtained.

I think I need scarcely point out that Mr. Cobley's process has the inestimable advantages over that which has recently been so

much eulogised that the value of the products obtained from each ton of ore is much higher, and that the process, instead of being applicable to sulphides only, is equally so to carbonates and other ores of copper—facts which miners will duly appreciate.

Swansea, June 21. CUPRUM.

EBERHARDT AND AURORA MINING COMPANY.

SIR,—A previous writer has stated that the best thing on the market is the shares in the above company; the price is low—3 to 3¼; and according to the last report there are indications of coming on the lode very soon, so that returns may soon be looked for. The directors have now money in hand by the recent issue of debentures to push on the works, and with the aid of the new and improved machinery better results will be obtained, and the produce increased. The guarantee of the payment of 4000*l.* cannot but be beneficial to this company by the South Aurora Company as well as to the South Aurora Company. From the above facts the shares are well worth the attention of the public as an investment. B. B.

RUBY MINING COMPANY.

SIR,—The remarks on this company in last week's Journal are I think written under a misapprehension as to the deduction to be drawn from the small support given by the shareholders towards raising a working capital. The reason for this was stated at the meeting on June 18—that there were 107 shareholders who were registered for 10 shares or under, and whose interest in the company is not large enough to induce any further outlay. Of the remaining shareholders many have their all or nearly all already embarked in the company, and many in these critical times cannot afford to withdraw from their business the money they would otherwise gladly "put on bottom" in this enterprise. Those who now find the fresh capital are I am informed large shareholders. The remainder of the remarks are not of such moment as to demand comment, beyond that they are incorrect, and it is evident that the writer did not sufficiently understand the points before he committed himself to paper.—*June 24.* A HOLDER OF 80 SHARES.

THE SCIENCE OF MINING.

SIR,—If, as concluded in my last letter, every effort has an adequately producing cause, it must be admitted that all sensible concrete objects were derived from something pre-existing, and that where forces act two conditions at least are necessary—a something to act upon, and a medium by which it can be exerted. It will be understood that I speak only in this connection of secondary causes—those which act under the impress of undeviating laws, and nowhere is the operation of law more pronounced than in the mineral kingdom. It may be more manifest in each of the other two great departments of Nature, for the simple reason that in these separate complete individual organisms may be examined, analysed, and comprehended, as they are distinctively individual existences—members of a series, and of a universal system; but a stone or a rock is but a fragment of a vast mass or zone, and cannot, therefore, be regarded as fairly representative of its own body, much less of the series or system of which it forms a part. But the composition of a stone analytically ascertained is not without its value in connection with mining, especially if it formed a part of the rock in which a lode or lodes are situate. What does the mineralisation of strata imply? Surely not the dissemination of the elementary particles or atoms of the metals throughout the pores or interstices of the rocks, as the metals in an elementary condition are in no sense mineralised. In the former they are simple, in the latter complex or concrete. But it may be asked are not all strata an aggregation of minerals? Even the clays, earths, and alkalies are they not all mineralised substances? I answer, Yes. But it is with the mineralisation of specific metallic matters that I desire to restrict my observations, in which sense it can only mean the presence of those substances such as iron, sulphur, and the acids which, by allying themselves to and uniting with the elementary particles, form the oxides, sulphides, carbonates, chlorides, &c., which are the principal ores of commerce? But where does the mineralisation of the metals take place? Surely not in the rocks to any considerable extent, but in the fissures in which they have been deposited together with the mineralising substances with which they become so intimately associated and so clearly identified. There are evidences from the exude of porous rocks after being cut through that the metals are sometimes detected associated with acids and with oxygen—the former in a semi-fluid or pasty condition, the latter sometimes similar and at others crystalline; but in no instance that I have ever seen does an occurrence of the kind take place without the aid of water. If there is a metalliferous exude from the pores of apparently solid rocks, as unquestionably there very frequently is, it must be regarded as an evidence that the metals in one condition or another are therein contained, and that it is through the agency of water that they are extracted, conveyed, and deposited in the several fissures and cavities, to be transformed into the workable and available ores of commerce.

If the capillary pores of the hardest stratified rocks, and some others which are highly enervated by heat and pressure, give off a metalliferous exude in a greater or less quantity, how much more may not the visible interstertial joints, seams, planes, and fractures contribute to filling up the various fissures which contain those valuable treasures without which no advance from the primitive customs and practices of barbarism could ever have been effected? But if joints, pores, seams, planes, and minute fractures in the rocks contribute to the filling up and furnishing the natural repositories of metallic wealth, how much more largely may it not be concluded that cross courses, slides, dykes, and all other transvere or oblique intersections contribute to such a result? Is is, then, of no moment to study and consider the physical structure and conformation of a district on which the productiveness or otherwise of the lodes so entirely depend, as well as the success of enterprising explorers whose reputations or fortunes, or both, may be at stake in prosecuting the developments. Mining aided by an intelligible theory, and mining without one, equals the difference which exists between daylight and darkness; whilst, on the other hand, the absence of a knowledge of leading facts or first principles nothing of any value can be arrived at. If a person has no fixed ideas concerning the origin and formation of metalliferous veins and deposits his opinion of the prospective values can only be of the most superficial and untrustworthy kind, however practically experienced he may be in the working of mines and the extraction of the ores. It is an almost universally admitted and established fact that the productiveness of lodes is, to a large extent, affected and improved by their contact with cross-courses, porphyries, elvans, &c. It will, therefore, appear that in an auxiliary sense they are scarcely second in importance to the lodes themselves, inasmuch as they are the chief sources from whence the lodes derive their treasures. The physical structure embracing the more prominent and engaging features of rock formation are of surpassing interest to the miner viewed in the light of the aqueous theory, both as it respects the rocks and the lodes, flats, and deposits of metalliferous minerals contained therein.

Water is a mighty agent, a capacious medium, a powerful solvent, and its operations and effects in connection with the dissolution and re-formation of mineral matters and mineral masses is consonant with and analogous to Nature's laws and operations in the animal and vegetable kingdoms. The sedimentary rocks in their pristine order, and many—nay, most—others which have been rigidly indurated by pressure and heat, act as filters through which the metals and their mineralising concomitants pass in solution in the percolating waters in channels to their destined repositories, to undergo a veritable transformation and appear in the form in which we find them.

It is from the above and similar ocularly demonstrable views that the physical formation of mining districts derive their great importance, and inspire intelligent observers with so deep and absorbing interest. Its analogy to the other active modes and operations, both as it respects causes and effects throughout all Nature, is so indubitably consonant that nothing short of unquestionable ignorance, a persistent perversion of facts, or a reckless disregard and violation of the rules of inductive philosophy, could presume to ignore its teachings. The theory of the formation of metallic and other minerals of commerce by infiltration is, as far as I have been able to observe its phenomena, the only one consistent with reason and self-evidencing facts. It is utterly impossible that heat could generate the metallic and other minerals in the form and condition in which we find them. Heat is sensibly and latently present in the rocks and in the water, in many instances in the latter condition in very considerable quantity, but it would be as rational to conclude that because the sun shines on the surface of a lake, or that oxygen is a component part of water, that the sediment found at its bottom was due to those agencies, or that the current electricity or plutonic fires known to exist in the earth at variable depths were the originating causes of metalliferous deposits.

Llanrwst Lead Mine, June 25. ROBERT KNAPP.

THE MINING INTERESTS—STAGNATION.

SIR,—At this moment money is not only superabundant, but has become actually a drug in the market, yet trade, enterprise, and commerce languish for lack of its support. The exigencies of manufacture and risks of trade preclude the free use of money when the possessor of it can only safely obtain 1 to 1½ and 1½ per cent. interest. The most costly war that this country ever encountered has been the contentions between capital and labour—strikes and lockouts culminating in the loss of markets, the sacrifice of hardly earned and hoarded gains, and the rough dissipation of the enforced though ephemeral high wages of workmen. It is a well recognised truism that capital and labour are the true parents of national as well as individual progress and wealth; still they must remain cordially and firmly united to ensure success. Whenever labour dictates and becomes uppermost, capital vanishes like steam from the piston when the valve is opened. Hence, though all admit the force of union between the two, they cannot but likewise admit that they stand practically severed and devoured, and the workmen have themselves to blame chiefly for the results. It should be remembered that capital should never be protected wholly at the expense of labour, as whenever that occurs supply will exceed demand. In fact, all monopolies are objectionable, and calculated to inflict injury on the legitimate freedom of workmen. It should ever be remembered that the two great and twin forces of society are capital and labour, and whenever they become divided and stand apart insipient distrust ensues, that requires time alone to ripen into panic, subsequent confusion, and lastly distrust, as unhappily has prevailed since the default of Turkey to meet her engagements, the intrigues of Russia, and the lamentable war which can scarcely be said to have subsided even up to the present moment.

The markets for metals—lead, tin, and copper—show no improvement in the immediate future, or scarcely any activity. The fact is that mining yields an increased quantity of raw materials, while the stagnation in manufacture and enterprise lessen demand. The consumption of these metals must receive a striking and legitimate impetus before prices advance.

The mines throughout the United Kingdom look especially healthy in respect to yield—as, for instance, Wheal Peevor, South Condurrow, Carn Brea, Dolcoath, Mellanear, West Tolgus, and Crebor in the West, with Bwlch Consols and Cwm Brwyno in Cardiganshire. At Bwlch a new 60-in. pumping wheel is being erected, and it is satisfactory to learn that the bottom of the mine is most prosperous. The fact is that Goginan deep adit is extended east to the boundary, and thus at an early date the Bwlch will be drained to a depth of 120 fms. without the aid of machinery. There is a bright future for this mine. Mr. Underwood also possesses a first-rate property in the same district. In North Wales we have the Bodidris, Lead Era, and Pant-y-Mwyn, each highly promising adventures, and likely to become early prizes.

R. TREDINNICK,
Dealer in Stocks and Shares, Mine Owner, and Consulting Mining Engineer.

Cornhill, London, June 26.

MINERS' WAGES—THE PREMIUM SYSTEM.

SIR,—Your Lake Superior correspondent very accurately explains the reason why Cornishmen can get through a larger amount of work when employed abroad than when engaged in Cornwall—they have not the same encouragement to work. Now, from the very nature and disposition of the Cornish miner nothing is more easy than to give him the encouragement necessary, and at the same time securing increased advantage to the shareholders. Recently published statistics show that only in 1 case in 70 does a strike result in securing to men the advantage they strike for, yet it must not be supposed that in the remaining 69 cases the employers benefit by the strike. Indeed, in too many cases the employers' loss is the greater because they fall altogether into bankruptcy, which might have been avoided.

Taking a mine, there are always a large amount of fixed charges which have to be provided for, whether the men are working or idle, and whether 50 fms. of ground or 5000 fms. are being worked away. It has been stated that Devon Great Consols is losing 5000*l.* per annum, and the mine costs and merchants' bills appear to average about 2500*l.* per month, or (say) 30,000*l.* per annum. The first question, then, is how is this 30,000*l.* distributed. It may be supposed that the Chairman has 400*l.* and the other directors 600*l.* per annum, so that they get 5 per cent. interest on an investment of 20,000*l.*, and this being as much or more than they have put in, they may be left to take care of themselves. The agency and daywork charges are said to be very heavy, so we may call them nearly 800*l.* per month, or 10,000*l.* a year. Coals and necessary materials not charged against the miners may be taken at another 9000*l.*, which makes 20,000*l.* altogether, leaving only 10,000*l.* for the actual ore-getting miners; therefore, the payment of 10,000*l.* in real wages is expected to earn profits on 30,000*l.* working expenses. As the directors and agents get their salaries under any circumstances they care little more than to make the shareholders believe that they are doing something for what they receive, and they find the easiest way of doing this is to make a noise about cutting down the ore-getting miners' wages, and knocking a little off the poorer portion of the day-wage men. On this system the ore-getters suffer most, and in the result all who can put on the day-wage list. In the interest of shareholders just the opposite feeling should prevail—all should prefer piecework to daywork, as they, in fact, would do under proper arrangements.

To make the matter clear without trouble we will suppose that the fixed charges of 20,000*l.* cannot be reduced, and that the 10,000*l.* paid to the ore getters represents the removal of 2000 cubic fathoms of ground. Everyone will understand that if 4000 cubic fathoms be removed instead of 2000 the fixed charges will be 5*l.* per fathom instead of 10*l.*, and the actual cost to the adventurers (the ore getters still receiving 5*l.* per fathom) 10*l.* per fathom instead of 20*l.* By the premium system, which has worked admirably in Switzerland, this 10*l.* per fathom surplus would be divided among the adventurers and ore getters. The process will be best understood by taking the case of a bargain to be let. We have (say) the Peter Watson level, which, being hard and of little value, would be worth 8*l.* per fathom to drive, and 3 fms. could be driven in a month—that is, under present arrangements. The bargain would be thus offered—"How much per fathom for driving the Peter Watson level 3 fms. in one month?" The first bid might be 7*l.* 10s., and this would be advanced upon by the ore getters until it was at last set at 8*l.* per fathom—that is, the pare taking the bargain agree to drive 3 fms. in one month at 8*l.* per fathom. Now comes in the discount and premium system. There would be a standing rule at the mine that excess of speed makes excess of price, and *vice versa*; in both cases per cent. for per cent.

Take the first case. The men can only do 2 fms. 3 ft. in the month, as they have reached only five-sixths of the speed they receive by five-sixths of the price per fathom—that is, 6*l.* 13s. 4d. per fathom, or 16*l.* 13s. 4d. for the month's pay instead of 24*l.* Here the men would lose largely, but they would willingly bear the loss because they know that they have lost at fair speculation, though the speculation was a bad one. Take the second case. The men work extra hard, and 4 fms. instead of 3 fms.; then, the speed being one-third greater, the pay is one-third per fathom more—that is, 10*l.* 13s. 4d. per fathom, giving them 42*l.* 3s. 4d. for their month's work instead of 24*l.* In practice the differences would never be so wide as this, as both agents and men well know to within a foot how much can be done in a month, but from this example the principle will be understood.

As all work done is supposed to be for the benefit ultimately of the adventurers, it could be arranged that any man working his full time should be paid a minimum wage of 12s. per week. By these arrangements the men would be encouraged to work, and it would be to the advantage of the adventurers that every miner should earn large wages, whilst the men would always be working in high spirits, as they would never have the thoughts of subsist to pay off to depress them. By such an arrangement the adventurers would at Devon Great Consols get their ore at 20 per cent. less than at present, and the miners would receive 20 per cent. more wages.

Tavistock, June 24. JUSTICE.

HOME MINING.

SIR,—If parties interested in our home mines have carefully read the letter in last week's Journal, under the head of Mining at Lake Superior, they will see that if the mines named by the writer were worked on the principle and under the same conditions as the foreign mines named by him no fear need be entertained of Cornish mines being interfered with in producing tin at a much lower rate than it can be produced in any other part of the globe. As well might we attempt to work now without the aid of steam-engines, and to do all (if it were possible to be done) by manual labour as it is to attempt to work mines without the latest improvements of all kinds, among the most important being the best boring machines, which alone place the production of mines equal at least to three times the quantity they have been enabled to raise hitherto. To those who are now waiting for better prices of metals they must be blind indeed if they imagine their hopes are to be realised; the old times have passed away, and we shall never see a return to the prices of 1872-74. Thus much for our home and foreign mines.

The other great cause, and the main cause, of our home mines not doing so well as they could do has been admirably pointed out also in the *Mining Journal* of the 21st instant, under the head of The Cornish Miner at Home and Abroad, and signed by "A Miner." I agree with every word therein stated. As long as men are stented to 14s. a week, and not allowed to perform the work necessary to get a good living for themselves and dependents so long the mines will pursue the onward course to ruin, and nothing can or will prevent them from doing so; but give a man a fair contract from month to month, or for three or six months, and you need not bother or trouble yourself as to Maze Mondays and holidays. He is as anxious to work for the shareholders as the shareholders are anxious for him to work. But make him a slave and half starve him, and the fate of both parties is sealed. No man in this country has been engaged with a larger number of mines for the last 40 years than the writer, who has seen every system tried, and every one fail but the right one, which is to get as much work done for money enough to give the miner good living, and not to drive him from his home and his country. ANOTHER MINER.

June 24.

ROCHE FELSPAR WORKS.

SIR,—For the information of an "Occasional Correspondent" I append an analysis of the Roche Felspar Company's felspar. The analysis was made by Mr. John Pattison, analytical chemist, Newcastle-on-Tyne, with the following results:—

Silica	63·17 per cent.
Alumina	20 89 „
Peroxide of iron	0·14 „
Lime	0 90 „
Magnesia	0·21 „
Potash	11·48 „
Soda	3·11 „
Total	99 90 per cent.

Finsbury House, Roche, June 26. J. R. PARKYN, Jun.

JIGGING MACHINERY AT WHEAL JANE.

SIR,—Those of my co-shareholders in the above mine who attended the last meeting will recollect our manager, whilst speaking of the reduction of costs in the dressing department, saying he thought it could be still further reduced. This will undoubtedly be accomplished, for have they not in an incredibly short period of time erected jigging machinery—the first in the county—for the treatment of tinstuff directly from the stamps grates, and the success attending their efforts is complete, not only as regards crop tin, but also for the smalls, independent machinery for which will be put up immediately. The saving effected by the introduction of these machines into our larger tin mines would be something enormous, not only in manual labour, but also the loss sustained by tin now escaping into the Red and other rivers would to a large extent cease. But of this I will say no more at present, as I understand that when the floors are completed an invitation to some of our eminent mining authorities to inspect the various improvements is to be issued by our worthy purser, after which we may reasonably look forward to having opinions on this matter of far more weight than mine can possibly be.—*June 24.* A SHAREHOLDER.

ROOKHOPE MINE.

SIR,—I greatly regret to see from your report of the Rookhope Company's meeting that so insufficient a response has been made to the appeal of the directors for more capital to carry on the mine. The shareholders are thus running the risk of losing what there is every reason to believe is a very valuable property, quite justifying the remark of the Chairman that "with a little extra capital and some little improvement in the price of lead he had no doubt of the ultimate success of Rookhope." I entirely agree with him, judging from what I have heard in the neighbourhood concerning the mine. Having had frequent opportunities of conversing with miners who have worked there, I find that all agree in saying that Rookhope if properly and economically managed, with a respectable price for lead, is a mine that ought to repay well both owners and workmen, and be a lasting and increasing source of income. I say "increasing," for success in the present workings would enable the directors to open out the other mines on the property, which, especially the Brandon Walls, the working miners consider the most valuable portion of the royalty. I have often heard regret expressed that the directors had not seen their way to open them out, as success then was assured. For the sake of the shareholders, including myself, I quite agree with the feeling expressed at the meeting—that it would be a great pity to wind-up the company; and, therefore, sincerely trust that before the adjourned meeting comes on a sufficient amount may be subscribed to justify the directors in continuing operations.

A SHAREHOLDER IN THE DISTRICT.

MINING IN THE LLANARMON DISTRICT.

SIR,—I note with a considerable deal of pleasure the remarks of "An Old Miner," under the above heading, in last Saturday's Journal. I was, however, rather at a loss to understand clearly what is his meaning. Does he mean to indicate to your readers that all the advantages he speaks of would accrue from a resuscitation of the workings of the Old Westminster Company? Or does he mean that the above workings are the centre of a system of lodes, flats, &c., which if taken up by a strong company might the more easily be worked from the present workings of the Old Westminster Mines? This is a matter of great importance to this district, and I have heard (how far it may be correct I cannot say) that it is in contemplation to form a very large company to work this estate—in fact, upon the southern portion of it there has lately been discovered a strong body of lead in a large vein running, as I am told, east and west parallel with the great Westminster vein. It would be a great pleasure to me to have a full and correct description from "Old Miner" of the mineral resources of the Llanarmon district given from time to time in your valuable Journal. Besides the Pant Du, East Pant Du, Bodidris, Lead Era, Plas Du, Belgravia, and the Old Westminster Mines I should like to see from "Old Miner" what other portions

of the district are being developed or are worth attention. I am greatly obliged to Mr. Knapp for his very clear remarks on the Science of Mining, and hope he will not leave off because of the adverse criticism of a "Chiel taking notes." ENQUIRER.

Lancashire, June 23.

[For remainder of Original Correspondence, see to-day's Journal.]

Meetings of Public Companies.

NERBUDDA COAL AND IRON COMPANY.

The nineteenth ordinary general meeting of shareholders was held at Queen Victoria-street, on Wednesday,—Mr. WILDE in the chair.

Mr. F. R. BLUETT (the secretary) read the notice convening the meeting. The directors' and manager's reports and the accounts were taken as read. A special report from Mr. H. B. Medlicott, superintendent of the Geological Survey of India, on the company's properties, was also taken as read.

The CHAIRMAN said he regretted that there was not a larger attendance of shareholders, for a great deal of information was frequently elicited by questions. The first matter he had to refer to was the death of their old colleague, Mr. S. Lloyd Foster, who was, with the exception of himself (the Chairman) the only original director of the company. Mr. Foster's health had been such during the past two or three years that he had not been able to attend very often the board meetings, but in the early days of the company he was a very great benefit to it, and often came to the board meetings, spending more for his journey than his fees came to. The directors very much regretted the loss the company had sustained by his death. With respect to the small output, the manager entered pretty fully into the reasons for that. Last year he (the Chairman) stated that two new engines had been sent out, and it was expected that when they got to work—shortly after the monsoon—they would be able to increase the output very considerably. He had been very much disappointed that this had not been the case. In the first place there was some delay in erecting the engines, the second of which did not arrive before the monsoon, and could not be carried over the river until the bed was dry, the bridge not being strong enough to bear the weight of the engine. When the engine got to work the water had so largely accumulated that it took a longer time than either he or Mr. Maughan had anticipated. The third reason of the delay was the large increase in the inclination of the coal, which was now no less than 30 in. in the yard—that was, for every 36 in. they went horizontally they had to sink 30 in., which increased the difficulties and expense of getting the coal out. It was, however, thought that a change would soon take place, and that the coal would be thrown more horizontally, and that it would be easier to get; indeed, this seemed to be self-evident. He was confident last year that the expenses would have been met, and that a small dividend besides would have been possible. He did not expect any grand dividend until the shaft on the Mulpee plain had been sunk to get the coal in a better and cheaper way. With respect to the fire, Mr. Maughan had got 1500 tons of coal from the workings, which were shut up by an error of judgment of Mr. Maynard. It had always been a puzzle how the second fire took place (he had never believed that it was the work of an incendiary), and Mr. Maughan suggested that it might be a continuation of the first fire, though at a lower level. Attention was now being directed to working out the coal in an area surrounded by stone dykes, and then to work beyond that limit, so that the fire could not spread to the future workings. In one part the water was being pumped into the mine at one place and being pumped out at the bottom, so as to check the fire and enable them to get out more coal than they otherwise could. There was coal enough there to last for two years at a return of 500 tons a month from that part of the mine alone, and when that was worked out that part would be deserted, and the crust of the earth allowed to fall in. With regard to money, some of the shareholders thought—and the matter was fully discussed—that a call should be made, but the directors thought it inexpedient to do so, owing to the large amount of capital which they had expended, in consequence of the long delay in opening the Great Indian Peninsula Railway. The money could be borrowed, and the repayment spread over a certain number of years, and he thought that would be more advantageous than making a call. The 3000*l.* borrowed on debentures had been spent on the new engines and the cost in connection with them, and they had borrowed on temporary loan from the bankers and other people a further sum of 2300*l.*, which had been spent on the new drill and other expenses. The directors had endeavoured to practise great economy, and in everything in which reduction could be made without really impairing efficiency reduction had been made. Their home expenses were also less, although they had not during the past year had the assistance of the company, which had for some years shared those expenses with this company. There was every possible reason for the directors to reduce the expenses, for the two largest shareholders in the company were members of the board—one of them holding nearly as many shares as any two of the proprietors together. Mr. Medlicott, in his report to the Government some time ago, suggested that this company should spend more money in boring on their territory. The Government had been making borings in their neighbourhood, and one of them was the deepest ever made in India—he believed it was over 700 ft.—but they entirely failed to find coal anywhere near this company's territory. Mr. Medlicott then suggested that the Government should bore in the company's territory at their own expense, unless the results were to the advantage of the company, but the directors could not agree to this, and suggested that they (the company) should spend the 6*d.* per ton royalty for the next five years in borings in their territory at such places as the Government should think fit. The directors were promised that this proposition should be made to the authorities, but in the meantime Mr. Medlicott visited the mine, and made the report which had been forwarded to the shareholders, and that was considered so favourable, and the Chief Commissioner thought their prospects so good, that he would not be justified in asking the Government to consent to the proposition made by the directors. The board had since written stating that however good their prospects might be, that profitable results had been very long expected, and that it would be an advantage to the Government as well as to this company if the borings were made, and he was not without hope that the suggestions would yet be acceded to, as he believed Mr. Medlicott was personally in favour of it. With regard to the sore subject of the new winning, Mr. Maughan was of opinion now that the best thing was to go down with the existing shaft on a practically smaller diameter, and this was what they intended to do, and a drill recommended by Messrs. John Taylor and Sons (which had been worked in the Halkyn Mountain, North Wales) as the best and cheapest drill they could employ, had been selected, and it was believed that the new winning would be sunk to a sufficient depth during the year, and they would then work upward instead of downwards, which was a much easier and better system in every respect. They would, no doubt, have by this means an abundant supply of coals for many years; at all events, that was the opinion of all those who were competent to express an opinion on the subject. The Chairman then referred to the fact that the Government had at last, after working at a loss, determined to raise the cost of Nagpore coal, at which he was not surprised. He thought it was very unfair to private individuals that the Government should have worked their coal at a loss, for if they had charged a price which enabled them to make both ends meet this company would have shown a profit of 500*l.* or 600*l.* on the output, instead of a loss. Hereafter he trusted that they would have better prices and a larger output, for Mr. Medlicott had, since writing the report which the shareholders had received, made a further report to the Government expressing his belief that the company would have an abundant supply of coal at a moderate depth; but the output could not be counted upon until all the defects were remedied, and a proper state of working carried on. The Chairman, having expressed his wish to afford the fullest information, moved the adoption of the report and accounts.——Mr. J. R. MANNING seconded the motion.

The CHAIRMAN, in answer to a question, said the sales for January were 689 tons; February, 635 tons; March, 904 tons; April, 1115 tons; and to May 21, 731 tons.

Mr. A. SOLOMON complained of the long delay which had been experienced in realising any profits for the shareholders—(Hear, hear)—and although the Chairman said "hear, hear," he did not show them how they could get a dividend. He thought the home expenses were too heavy, and he moved that the Chairman should take only 100*l.* per annum instead of 200*l.*, and that Mr. Manning should be asked to undertake the duties of secretary, and allow the company the use of his office, for 250*l.* per annum.——Mr. JACKSON seconded the amendment.

Mr. ELLIOTT said his hopes had been considerably revived by Mr. Medlicott's report. He believed the company possessed a very fine property, but the difficulty was to put anything into the shareholders' pockets out of it; he trusted, however, that sooner or later the boring operations recommended by Mr. Medlicott would be carried out. He certainly thought the prospects of the company were better than they had ever been, and that any questions of reduction should be left to the directors for the present at all events. They had an enormous area, and there was a probability that besides coal they might discover valuable minerals of other kinds. He asked whether there was a fair prospect that the output would enable them to pay costs during the next year?

Mr. HEATHFIELD did not think the company should make further explorations for the purpose of ascertaining whether there was more coal in other parts of the property while they had such a plentiful supply. Perhaps the Chairman would state what was the relative value of their coal.

The CHAIRMAN, in reply, said some years ago some coal was sent to the Bombay and Baroda Railway, and it was reported as the result of the trial made with it that their fresh wrought coal was very nearly equal to the English coal used in India, which had probably been exposed for a year before being used. They had also sent 50 tons to the Delhi portion of the Scinde, Punjaub, and Delhi line, and that was found to be nearly as good as the Kurraballi coal, which was generally acknowledged to be nearly, if not quite, as good as English coal. Some of their coal dust had been made into patent fuel, and burned very satisfactorily on the Great Eastern Railway. He believed that the output would be sufficient to pay all the proper outgoings, except, of course, the expense of the new winning, which was a capital charge. The contract with the great Indian Peninsula Company could be terminated with six months' notice on either side. With respect to the expenses he had already suggested that he would temporarily give up half his fees, although he certainly would not remain there permanently at the reduction, for it would not pay him to do so, but he would most strenuously oppose any alteration in the office of secretary. All the accounts were kept here, and Mr. Bluett had proved himself to be a most able and efficient secretary. He had considerably reduced the expenses, and had made various recommendations which had been greatly to the benefit of the company.

Mr. HEATHFIELD added that he had always received great consideration and marked attention from the secretary. Every question he had ever asked that gentleman had been answered with the greatest straightforwardness and satisfaction, and he did not think any substitute could serve the company so well.

The CHAIRMAN, in reply to a further observation, said he did not think the company should make further borings on its own account until the shaft was down the required depth.

Mr. Solomon's amendment having been withdrawn, the reports and accounts were adopted. The retiring directors—Messrs. Samuel J. Wilde and John Hawkins, and Messrs. Waddell and Co., the auditors, were re-elected.

The meeting closed with a vote of thanks to the Chairman and directors.

ST. JOHN DEL REY MINING COMPANY.

The annual general meeting of proprietors was held at the Cannon-street Hotel on Wednesday,

Mr. JOHN HOCKIN, the Chairman, presiding.

The CHAIRMAN said—Gentlemen: In addressing you this time last year I said we did not anticipate being able to obtain such large produce during the year then entered on as in the past year. The important work of further developing the western ground, and work that could not be delayed in the eastern sections, would prevent our obtaining so large a proportion of high-grade mineral this year as we were able to quarry last. Since then we have had an unprecedentedly dry season to contend with, so that the produce has even fallen short of our then estimate of 36,000 to 38,000 oits. per month, for it has not been quite 35,000 oits. per month. It cannot, however, be too often repeated that this temporary falling off of the produce in no way indicates a deterioration of the mineral body as a whole. The proper working of the mine for permanence and security involves the carrying on of the important but unremunerative work of exploration, and necessitates the removal of more or less worthless and mixed mineral. The proportion of these increases as we extend the workings further from the central and rich sections either in an easterly or westerly direction. In proportion to the increase of inferior mineral the yield and produce decrease unless there be quarrying and hauling power to raise an amount in excess of the stamping power so as to admit of the worthless being rejected. The quarrying power this year has been limited by the employment of a larger force on works of extension and exploration, and the hauling power has been diminished, as I have already said, by want of rain. For these reasons we have been unable to reject any poor mineral: 69,954 tons have been raised, and all, except about 400 tons, used for other purposes, have been stamped. The yield has been in round numbers 6 oits., or nearly 14 dwts. troy per ton. The yield of 6 oits., or 14 dwts. of gold per ton, should not be considered low yield where the whole body of the lode is extracted and stamped to the extent east and west we have worked this year. There are sections of the lode which would yield 8, 10, or more oitavas per ton if taken out and stamped separately, but the history of the mine, from its first becoming productive, shows that where the whole body of the lode is fairly removed from its entire length the average yield has never reached 6 oits. per ton. Without giving each year separately I will name to you the average of each period of five years since 1848:—

		Oits. per ton.
From 1848 to 1852 the average was	.....	3 96
From 1853 to 1857	"	4 05
From 1858 to 1862	"	4 02
From 1863 to 1867	"	5 57

The highest yield per ton raised in any one year during these 20 years was 5·84 oits. Since the re-opening the average yield of the mineral raised has been much higher than before until this year, though in consequence of the weight of the mineral having been computed considerably below its actual weight the yield per ton, until this year, is placed on record some 20 per cent. higher than it should have been. This higher yield since the reopening of the mine has arisen from the mineral having been quarried, as the opening proceeded, from the more central sections of the mine. This will be seen from the sketch showing the ground excavated, which you have in the report. As we have extended east and west the yield has been lower. I have next to remark on the loss of gold in treatment. You will have seen that there has been an improvement. If the assays are correct, which we believe them to be, for they have been regularly checked in this country, the improvement is greater than is shown in the report, for last year's loss was greater than we supposed, from the mineral having been returned under its actual weight. Still the aggregate loss is, as we have shown, very large. I have been asked, why point so prominently to the defects in our system? My reply is, it is the surest way to find a remedy. A man who fancies himself perfect is never likely to improve; so it is in science, art, and manufactures. The wonderful advances that are being made in these in our day are only arrived at by a conviction that improvement is practicable, and a determined effort to attain it. Your officers have been zealously labouring to improve the process, and some good has been effected, both in the first process at Morro Velho, in improving the system of straking, and also in the second process of retreatment at the Praia. Here we have not been able to accomplish as much as we had hoped to do, for we have been obliged to use the water power for stamping mineral from the mine in consequence of the failure from decay of some of the Morro Velho stamps. These have now been reconstructed. With the limited power available, however, it has been ascertained that by the use of simple and inexpensive machinery, involving no great expense to work, the poor refuse can be concentrated from 2 or 3 oits. per ton to 10 or even 20 oits. per ton—*i.e.*, getting rid of the earthy matter and retaining the pyrites and gold. The means of successfully separating the minute particles of gold from the pyrites composing this highly concentrated mass has not yet been discovered. Several means have been tried, but as yet without success. A further process by calcination is about to be tried, the particulars of which are explained at page 67 of the report. The directors have been and are still in communication with several parties in this country on the subject, and Mr. Hollway's process has not been overlooked. This process has attracted the attention of a large number of scientific and practical men, has been largely experimented upon in their presence, and been fully discussed at meetings of the Society of Arts, under the presidency of Prof. Roscoe. These experiments appear to have been pronounced successful as regards certain classes of ores, and the discussions that have followed deemed satisfactory. The patentee, who has had small samples of the Morro Velho ores, and has, as we have, had them analysed, considers that it will succeed with these ores, but nothing short of a trial on a large scale is likely to be decisive. The directors are most desirous of affording every facility for such a trial, and are still in communication with Mr. Hollway on the subject. Its success would be most important to this company, but we feel that we must use due caution before incurring any considerable outlay for the purpose of adopting it. As regards the measures taken during this year with a view to increase the water power, you will find them detailed in the engineer's report. The additions to the water power by these new works, and by redistribution of the existing supply will, it is estimated, give an increased water power of 710 cubic feet per minute. The elephant stamps of two heads, to which I referred when last addressing you, has been completed, and had a trial run of 82½ hours. During this period 66 tons of mineral were stamped, the machine being driven at 90 blows per minute. Its effective rate is 130 to 150 blows per minute. Its duty at 90 blows was 19·2 tons per day of 24 hours, or 9·6 tons per head of 24 hours. The average duty of the ordinary stamps, as will be seen by the table, is 1·33 tons per head in 24 hours. The superiority, therefore, of the elephant stamps as a pulveriser is established by this trial, and it is presumed that when the straking arrangements are adapted to this increased rate of crushing, and the machine is worked up to its full power its superiority in every respect will be established. The grates used on this occasion were not so fine as the grates in ordinary use (why is not explained). With finer grates the duty would probably be less, but the increased pulverising power by working the machine up to its effective speed—which will be very great—should more than compensate for any deduction in respect of the grates. In regard to the new mine at Cuiaba, we informed you at Christmas that we hoped we should be able at this meeting to report the result of stamping 1000 tons of mineral taken fairly from the lode without selection. Up to the end of April 1396 tons so taken had been stamped, which produced in the stamps without any secondary treatment 1·884 oits. per ton. This is low yield, but the recovery was not 50 per cent. of the assay contents, so that we may expect a better recovery when the works are in a more advanced state. A yield of 2 oits. per ton it is calculated will more than pay expenses when operations are carried on on a larger scale. This it is intended to do as early as possible, as also to commence a deep adit to attack the lode some 40 fms. below the present workings. You will have observed that the mineral hitherto stamped has been taken entirely from the Fonte Grande section. By the last advices the Serrote section had been reached, and was being cleared of water and debris, so that ere long we may hope to learn what produce can be extracted from the mineral from that section, which was the one most worked by the Brazilian proprietors. The total expenditure in this property up to the end of the year has been 12,170*l.*—*i.e.*, 7860*l.* for purchase, duty, and law expenses, and 4310*l.* working expenses of opening out the mine and putting up the building as detailed at page 40 of the report. This expenditure is for a period of 20 months, and is net after crediting 823*l.* for gold sold, so that the net expenditure has been under 200*l.* a month; for February and March it was 152*l.* and 135*l.* respectively. To put up more stamping power and drive the deep adit the expenses will be increased until the stamps are at work, but the directors do not anticipate the monthly expenditure is likely to be very serious, and will be met by the monthly contributions to the reserve fund without drawing on the invested amount. We have informed you in the report of the steps we have taken to obtain an abrogation of the 4 per cent. tax—illegally imposed as we believe and are advised—on the produce by the Provincial Legislature, and of the ready and willing hearing we obtained both from the Minister in this country and the Prime Minister and Minister of Finance at Rio de Janeiro. I think it right to say here that whenever we have had occasion as foreigners carrying on our business in Brazil to seek concession from or protection in our just rights at the hands of the Imperial Government or Legislature of Brazil, we have received much consideration and protection, and I desire it to be clearly understood that it is the action of the Provincial, and not the Imperial, Legislature that we complain of in this matter. By the last advices we are informed that the matter had received the favourable decision of the Council of State, and had been by that body presented to the Legislative Assembly, by whom it had been referred to the Committee on Provincial Assemblies. As regards finance, you will see that on the arrival of the July gold we shall have a cash balance in hand of about 5000*l.*, and that our reserved fund now amounts to a very handsome figure. (Cheers.) In conclusion, the Chairman moved the adoption of the report and accounts.

Mr. ILLINGWORTH said that eight years ago he was at Morro Velho, and was a constant visitor at the reduction house. He then knew that the chief assay officer was turning his attention to this question of saving the loss of gold, and he thought the shareholders were also indebted to the directors for promoting enquiry on this point and for the liberal way in which they had placed machinery at the service of the reduction officers to carry on their interesting experiments. As a result of those experiments the saving of gold in the last few months had been ¾ oit. per ton. The arrastres did not seem to be quite so successful. The experiments seemed to have divided themselves into two heads—the concentration of the tailings and the extraction of the ore. As far as the concentration was concerned, the company seemed to be working towards a success by the combination of the buddle and the percussion table, but as regarded the extraction of the gold he thought they had not been so successful. Probably the formation of the dressing floors might account for a small percentage of the loss.

Mr. SPENCER HERAPATH said there was every reason to believe that the Cuiaba property would turn out as good a property as the old del Rey.

The CHAIRMAN, in reply to an observation, said that in the first working of the Morro Velho lode they never worked the whole lode, but selected the ore.

Mr. S. HERAPATH said they had always had the very satisfactory feature that the deeper they had gone the more concentrated and valuable had been the lode.

Mr. SCHOFIELD agreed that the prospects of the Cuiaba Mine were very good, and, looking to the excellent quality of the western ground, he considered the company was likely to have a prosperity equal to that which it had had before.

Mr. F. TENDRON, in seconding the resolution for the adoption of the report and accounts, said the appearance of the property was better than it was two years ago when there was poor mineral at the western ground which had to be taken away, but now good mineral was reached in the western ground, and it was making westward. He was glad there was no dissatisfaction at that meeting, for there was nothing more important than that the superintendent should be allowed to work the mine in the mode he considered most judicious, and should not be unduly hurried to make returns. Whilst the present works were in progress the shareholders must not expect that the returns would be much larger than now. As regarded the Cuiaba, they had there a lode 55 ft. in width, and there was working power equal to working 200 heads of stamps. At present only 12 heads of stamps were working, but he hoped that before long the number would be increased to 24 or more. He repeated his belief that the mine, on the whole, never looked better than at the present time, and there was every reason to believe that when Cuiaba got down it would yield as good returns as the old mine did at the same depth, but, of course, it would be some time before it was developed equal to Morro Velho.

The CHAIRMAN said, in reply to Mr. ILLINGWORTH, that for the last 12 months the directors had had their attention closely drawn to the state of the reduction department, and he believed the reduction officers were doing all they possibly could to solve the difficulty. He did not see his way by any mechanical means to save all or even half the gold, for it was so fine that it would float on the water, and even pass through the chamois skin with the quicksilver, and where they had to deal with gold in such a fine state of subdivision he did not see how they could save very much more by mechanical means. As regarded Cuiaba, later on, when they would be able to make a selection of the ores, the yield would, no doubt, improve.

The resolution for the adoption of the report and accounts was then put and carried.

On the motion of the CHAIRMAN, a dividend of 12½ per cent. was then declared for the past six months, payable on and after the 26th inst.

On the motion of the CHAIRMAN a resolution was passed authorising the directors to apply such portion of the uninvested reserve to the development of the Cuiaba Mine as they might deem desirable.

Mr. Bonamy Price, the retiring director, was then re elected.——Mr. PRICE acknowledged his re-election.

On the motion of Dr. TROUNCER, seconded by Mr. PHILIPOT, Sir J. Swinburne, Bart., was elected a director in the place of Mr. George F. Dickinson, resigned.

Mr. Spencer Herapath was re-elected an auditor, and Mr. George Austin was elected an auditor in the place of Sir J. Swinburne, Bart., elected on the board.

A cordial vote of thanks to the Chairman and directors, and to the superintendent and staff at the mines, closed the proceedings.

PRINCE OF WALES.—At the special general meeting of shareholders, held at the office of the company, on Thursday (Mr. J. Y. Watson, F.G.S., in the chair), the special resolution passed at the general meeting on May 30 was confirmed.

[For remainder of Meetings, see to-day's Journal.]

THE BANK OF IRELAND AND THE PRUSSIAN MINING AND IRONWORKS COMPANY.—The Irish Court of Queen's Bench had before it on Wednesday an application by the Bank of Ireland for liberty to mark final judgment against Mr. John Staats Forbes, London, for the sum of 49,053*l.*, for which it was alleged he had become liable on foot of eight promissory notes for 5000*l.*, each discounted by the bank for the late Mr. Henry Bewley, who had applied the money to meet liabilities in the Prussian Mining and Ironworks Company, having its chief offices at Dusseldorf. It transpired that Mr. Bewley, Mr. Ebenezer Pike, Mr. William Thomas Mulvany, and Mr. Forbes had made an arrangement known as a "consortium," and apportioned their respective liabilities in fifteenths, as to which it was arranged that the defendant was to become liable for one part. The transaction occurred in 1872, and in 1876 the bank, finding that the Prussian Company had become a failure, made their claim against defendant for the entire amount of four of the bills, upon which he was co obligor with Mr. Bewley. To obtain forbearance for two years he executed a guarantee to pay the entire amount, minus such just credits as could be obtainable from Mr. Bewley's estate. When they sought to put the guarantee in execution Mr. Forbes questioned his liability, and the action against him was then taken. In answer to the motion of the plaintiffs, defendant made an affidavit, in the course of which he swore he was advised and believed he had a good defence to the action.—Under these circumstances the Court declined to mark final judgment.—*Irish Times.*

COPPER ORES.

Sampled June 11, and sold at Swansea, June 24.

Mines.	Tons.	Produce.	Price.	Mines.	Tons.	Produce.	Price.
Betts Cove	133	10⅞	£5 14 6	Caveira	75	7⅞	£3 18 6
ditto	128	10⅞	5 17 0	ditto	75	7⅞	3 18 6
ditto	121	10⅞	5 17 0	Copper Ore	70	5¼	2 13 0
ditto	121	10⅞	5 17 6	ditto	70	5¼	2 13 0
ditto	121	10⅞	5 18 0	ditto	42	11⅞	6 8 0
ditto	120	10¾	5 12 6	ditto	12	17¼	9 5 0
ditto	120	10¾	5 13 6	Berehaven	82	11⅞	6 16 6
ditto	120	10¾	5 13 6	Cambrian	33	13⅛	7 7 6
Balade	114	16½	9 4 6	ditto	24	9⅝	5 0 0
ditto	113	16½	9 4 6	ditto	1	14¾	8 17 0
Caveira	75	7⅞	3 18 6	Copper Ore	3	21	11 19 0

TOTAL PRODUCE.

Betts Cove	999	£3746	19 6	Berehaven	82	£ 559	13 0
Balade	227	2094	1 6	Cambrian	58	372	4 6
Caveira	225	883	2 6	Copper Ore	3	35	17 0
Copper Ore	194	750	16 0				

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
Copper Miners' Company	293½	£ 1,897 19 6
Vivian and Sons	140	871 0 0
Williams, Foster, and Co.	842½	5,042 16 6
Mason and Elkington	261½	1,714 6 0
Landore Copper Company	245	1,436 12 0
Total	1788	£10,462 14 0

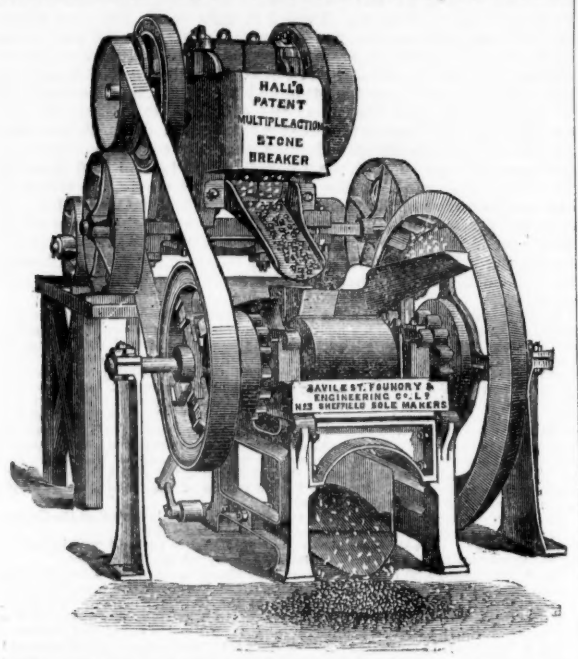
TOTALS AND AVERAGES.

	21 cwts.	Produce.	Price.	Per unit.	Standard.
Whole sale	1783	10⅞	£5 17 0	10s. 8d.	£77 12 10

Copper Ores for sale on July 8.—Betts Cove 86)—Berehaven 215—Copper Ore 216—Copper Precipitate 11—Copper Ore 11—Tigrony Precipitate 10—Copper Ore 9.—Total, 1352 tons.

COMBINED STONE-BREAKER AND CRUSHING ROLLS.

The efficiency of the Blake Stone-Breaker and Cornish crusher are so well known that the plant of a mine would certainly be considered incomplete which did not include those appliances; but that all machines are capable of improvements in details cannot be doubted. Mr. Charles E Hall, of the Savile-street Foundry and Engineering Company, Sheffield, has designed an improved arrangement of crusher and rolls designed for pulverising ore and similar materials, and which is likely to come largely into use. The machinery is made with a stone-breaker as small as 9 in. wide by 5 in. at mouth, and with 9¼ in. diameter chilled rolls, costing not more than 120*l.* with its raff-wheel, elevator, and sizing apparatus complete, up to a machine 20 in. wide and 9 in. at mouth, and rolls 28 in. in diameter, for dealing with large quantities of ore, &c., and costing 350*l.*, for mines where the output is considerable, and where the erection of a permanent plant appears to be justified. With reference to the working of the machine Messrs. Marr and Black, of Bradford, state that it turns out more work, better, and with less power, and, owing to the peculiar action of the jaws, with less vibration than the machines of other makers, and that the crushing-rolls also turn out about three times as much as the old style of machine.



The machinery being a combination of the well-known stone-breaker with the equally well-known crusher there will be no doubt as to the working, but the novel features claimed in Mr. Hall's arrangement are the portability of the crushing plant, making it applicable to mines in course of development, and where the capital at command is limited; its cheapness as compared with any existing plant doing the same work, and its special adaptation to foreign mines, where cost of carriage is a serious item, and skilled labour expensive; and its completeness, rendering no costly foundation necessary, and the fact that each machine is self contained, and independent of all extraneous fastenings or supports, and can, therefore, be set to work in a few hours by the most unskilled workman, and from printed instructions. The stone-breaker is constructed upon the Blake principle for operating the crushing jaw, but instead of a single vibrating jaw, as in that machine, worked by a connecting-rod, and toggles exerting all their energy at one period of the revolution of the eccentric shaft, at which moment three distinct operations are performed—*i.e.*, to crush the ore, to lift the heavy moving parts of the machine, and to compress a spring powerful enough to return the vibrating jaw 250 times per minute, we have the same principle of eccentric, connecting-rods, toggles, and crushing-jaw, but they are divided vertically into two complete sets, and the eccentrics upon the driving-shaft are placed exactly opposite each other, so that each vibrating jaw works independently and alternately, dividing the work into two halves, each half operating at different periods in the revolution of the eccentric-shaft, and as a consequence placing the whole of the moving parts in perfect equilibrium, reducing the intensity of the strains nearly 50 per cent., equalising the work, reducing the vibration to *nil*, and consuming fully 30 per cent. less power than any other stone-breaker of the same size. Being self contained and mounted upon wheels the machine is easily transported, and requires no fixing, being perfectly steady at 300 revolutions per minute, the absence of vibration rendering it suitable for elevated positions upon a foundation simply strong enough to carry its weight.

Hitherto crushing-rolls suitable for reducing ores for the further operations of washing and classifying have been used. These take their first motive power from some high-speed shafting, in which the speed has to be reduced some 12 to 18 times by means of massive spur-gearing. Where a stone-breaker is used the presence of a high-speed shaft becomes an absolute necessity. In these improved rolls the first speed is reduced about 16 times at once on to the roll-shaft, with a corresponding increase of power, by the adoption of patent differential gearing. The driving roll is secured to a hollow shaft revolving in bearings at each side of the frame, with an arm projecting from its side, in which revolves the high-speed or first-motion shaft, and upon which is keyed the driving pulley or fly-wheel, making (say) 160 revolutions per minute. Upon the enlarged part of this shaft is an eccentric, keyed thereto, and upon it is mounted loosely an external toothed wheel (held from rotating by a lever), with (say) 15 teeth, gearing into an internal toothed wheel, with (say) 16 teeth keyed permanently to the roll shaft, causing it to rotate in the same direction as the driving-pulley, but 16 times slower. There are no extraneous bearings and the whole of the strains are contained with the roll itself rendering it noiseless when at work, self-acting in its lubrication, and perfectly self-contained, easily mounted upon wheels for transport or fixed.

The whole of the gear is enclosed from dust, all the parts are easily accessible; and as the manufacture has been established with a view to duplicating the various parts of the machine, by making all to gauge and template, in the event of breakage, any accident can be immediately repaired. Large wearing surfaces and careful workmanship and good materials are used in their construction. Rotating screens may be used, which are constructed of perforated steel plates made expressly for this purpose, and with any desired size of holes therein. The raff-wheel takes up the rejected portions and refeeds them along with fresh material into the rolls. Special flexible steel elevators are also manufactured by the Savile-street Foundry and Engineering Company, suitable for mining operations, and lasting six times as long as indiarubber or leather beltings, are much simpler than wrought-iron chains, and with a greater wearing surface and less friction.

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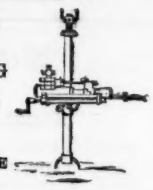

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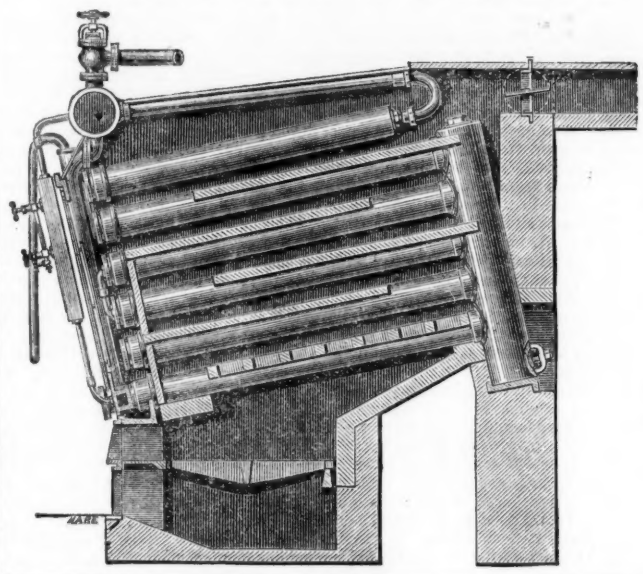

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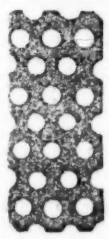

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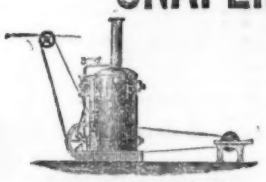
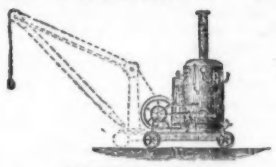


STATIONARY ENGINE. No Building required.



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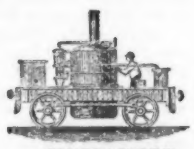

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* *These Cranes were selected by H.M. Commissioners to receive and send away the Heavy Machinery in the International Exhibitions 1862, 1871, and 1872.*

The ORIGINAL combined Vertical Engines and Boilers, introduced by Mr. ALEX. CHAPLIN, specially designed and adapted for PUMPING, WINDING, HOISTING, SAWING, DRIVING MACHINERY, and for GENERAL CONTRACTORS' WORK, RAILWAY SIDINGS, COAL MINES, QUARRIES, GAS WORKS, &c.

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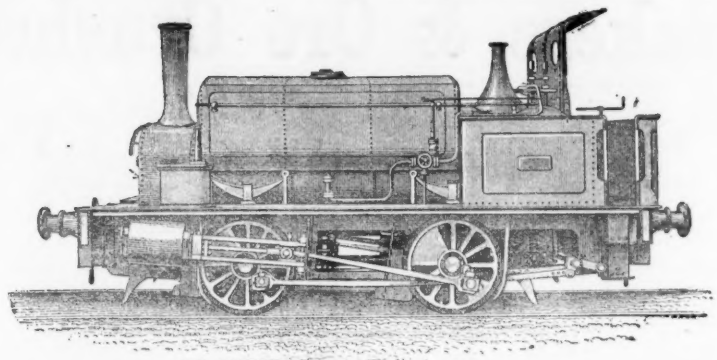

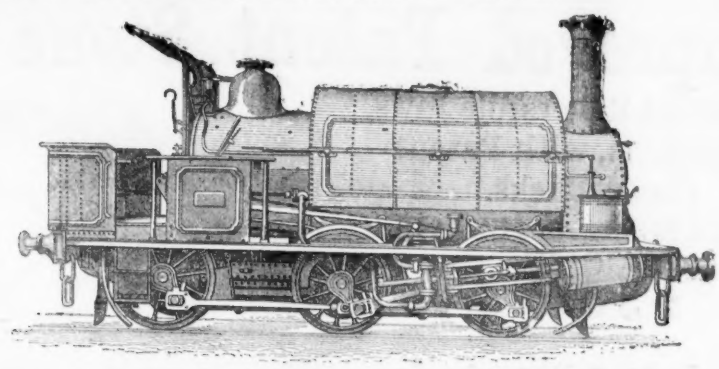

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NEW LOCOMOTIVES, with Cylinders 8 in., 10 in., and 13 in. diameter, always in stock or in progress. SECOND-HAND LOCOMOTIVES, of various sizes, FOR SALE OR HIRE.
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ATTERCLIFFE, SHEFFIELD,

DEVOTE THEIR EXCLUSIVE ATTENTION TO THE MANUFACTURE OF

CRUCIBLE STEEL CASTINGS,

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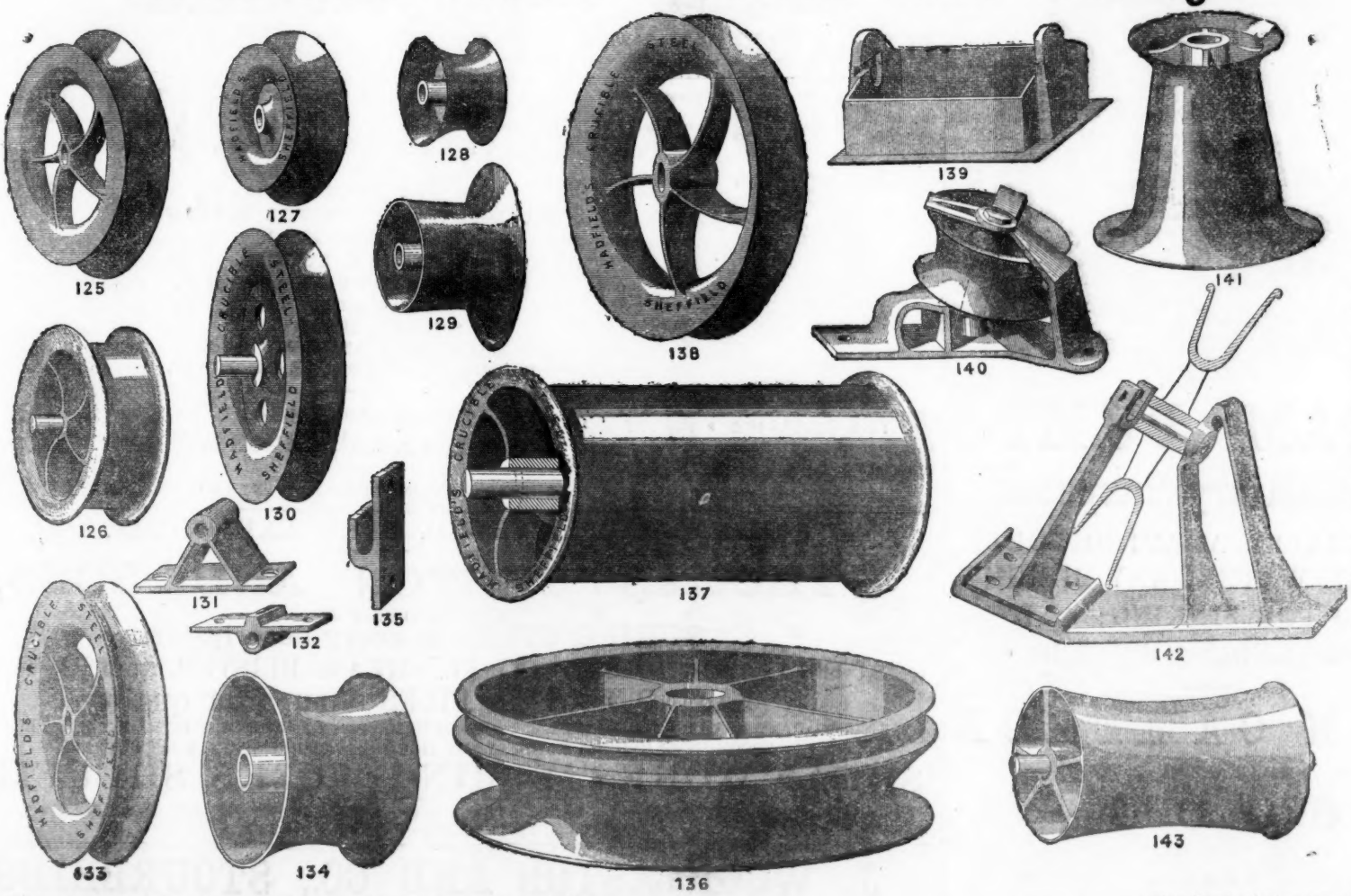

This Advertisement is varied from time to time.

The following are some of the advantages claiand med by the above Rolers Pullleys:—

[*This Sheet of Drawings is Copyright.*

1.—LIGHTNESS.—They are cast by us from one-third to one-half lighter than cast-iron.

2.—SAVING OF HAULAGE POWER AND WIRE ROPES.—Our Pulleys and Rollers, being extremely light, they effect a great saving in haulage power, and considerably prolong the life of wire ropes. As our Rollers and Pulleys are equally balanced, and never lob-sided, the instant the rope or chain touches they readily revolve, and all grinding or sawing by the rope is avoided.

3.—STRENGTH.—Although extremely light they cannot be broken by ordinary means—say by the sudden passing of chains over them such as frequently connect the rope to the wagon, or hang loose from the end of the passing wagons.

4.—DURABILITY.—One of our Crucible Steel Rollers or Pulleys will outlast about TWELVE IRON ONES.

5.—They reduce wear and tear to a minimum, and are a great saving in working expenses.

FOR LIST OF PATTERNS, SIZES, AND WEIGHTS, SEE LISTS No. 7. FOR ROLLERS AND No. 7A FOR PULLEYS.

MACHINE MOULDED STEEL GEAR WHEELS OF EVERY DESCRIPTION.

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THE GOLD MEDAL, THE SILVER MEDAL, AND HONOURABLE MENTION
FOR MY LATEST PATENTED STONE BREAKERS AND ORE CRUSHERS.

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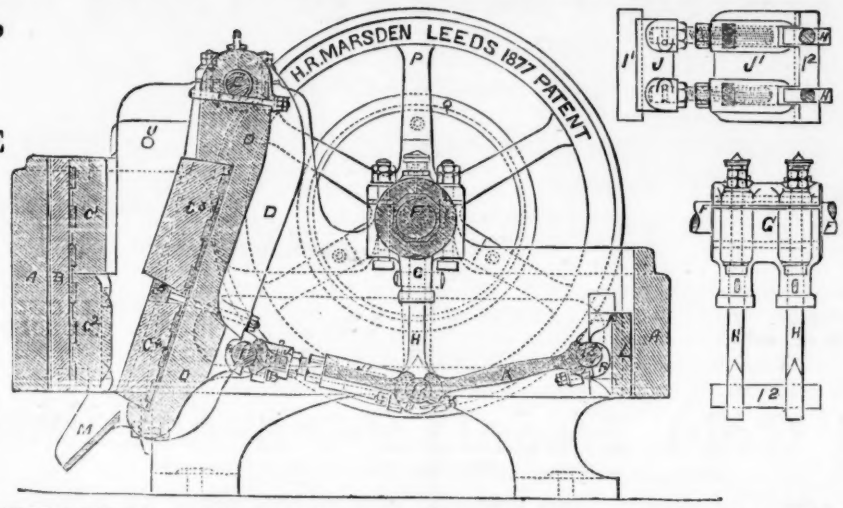

READ THIS—

Wharthole Lime Works, Maryport, Whitehaven, November 7, 1873.

H. E. MARSDEN, Esq., Soho Foundry, Meadow-lane, Leeds.

DEAR SIR,—The machine I have in use is one of the large size, 24 in. by 12 in. The quantity we are breaking daily with this one machine is 250 tons, the jaw being set to break to a size of 2½ in. We have, however, frequently broken over 300 tons per day of ten hours, and on several occasions over 360 tons during the same period. The stone we break is the blue mountain limestone, and is used as a flux in the various ironworks in this district. We have now had this machine in daily use for over two years without repairs of any kind, and have never had occasion to complain of any inconvenience in using the machine. I hope the one you are now making for me may do its work equally well. The cost—INCLUDING ENGINE-POWER, COALS, ENGINEMAN, FEEDING, and all EXPENSES OF EVERY KIND—is just 3d. per ton. Should any of your friends feel desirous of seeing one of your machines at work, I shall have much pleasure in showing the one alluded to.

I am, dear Sir, yours very truly,
WILLIAM MILLER.

AND THIS—

Wharthole Lime Works, Aspatria, Cumberland, July 11th, 1878.

H. R. MARSDEN, Esq., Soho Foundry, Leeds.

DEAR SIR,—We are in receipt of your letter of 4th inst. I may just state that the stone breaker above named has been under my personal superintendence since its erection, and I have no hesitation in saying that it is as good now as it was five years ago.

I am, dear Sir, yours faithfully,
FRANCIS GOULD.

GREATLY REDUCED PRICES ON APPLICATION.

ALL BEARINGS are renewable, and made of H.R.M.'s Patent Compound ANTIFRICTION METAL.

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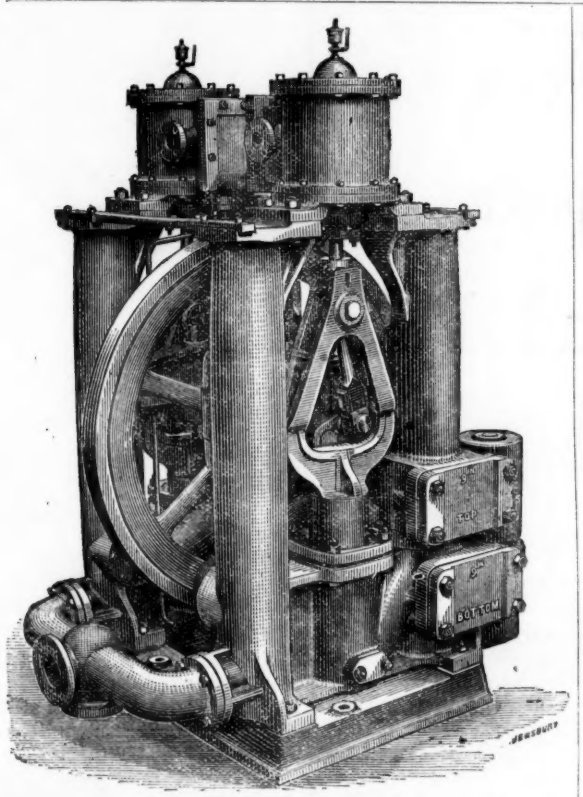
H. R. MARSDEN will exhibit in full operation SEVERAL of his Patent Machines, Stone Breakers, and Ore Crushers.



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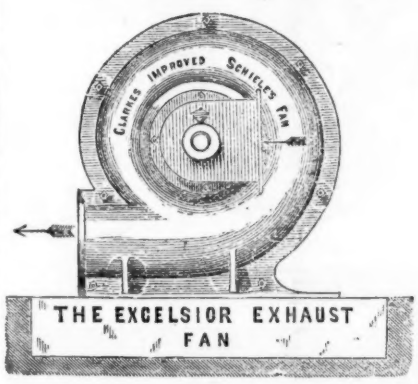

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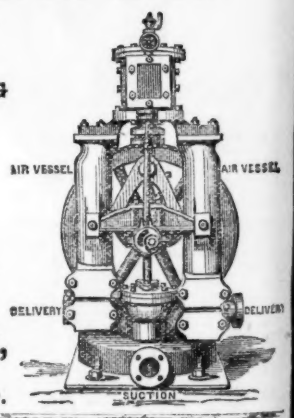
DOUBLE-ACTING STEAM PUMP.



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